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10/596,151	06/01/2006	Robert Manzke	PHDE030411US	2812

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EXAMINER	
CORBETT, JOHN M	
ART UNIT	PAPER NUMBER
2882	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/596,151	MANZKE ET AL.	
	Examiner	Art Unit	
	JOHN M. CORBETT	2882	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *01 June 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-12* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-12* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *01 June 2006* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *1 June 2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The specification is objected to because it refers to claims 1-12 on pages 3-4, which may create discrepancies and new matter issues if future claim amendments were to be made. Therefore, the examiner suggests removing all references to the claims that are in the specification. Appropriate correction is required.

Drawings

2. The drawings are objected to because in Figure 1, the unlabeled rectangular boxes 7, 8 and 10 shown in the drawings should be provided with descriptive text labels.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will

be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

3. Claim 12 is rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

With regards to claim 12, the claim is drawn to a computer program per se. A computer program per se is a set of abstract instructions. Therefore, a computer program is not a physical thing (product) nor a process as they are not "acts" being performed. As such, these claims are not directed to one of the statutory categories of the invention (See MPEP 2106.01), but directed to nonstatutory functional descriptive material.

It is noted that computer programs embodied on a computer readable medium or other structure, which would permit the functionality of the program to be realized, would be directed to a product and be within a statutory category of invention, so long as the computer readable medium is not disclosed as non-statutory matter per se (signals or carrier waves).

An example that would make the instant claims statutory would be to claim a computer readable medium encoded with a computer program which, when implemented on the data

processor, instructs the data processor to perform the desired method steps. Hence, the claims would be directed to statutory subject matter.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 4, 6 and 11 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

With respect to claim 4, the phrase "if" renders the claim indefinite because it is unclear whether the limitation(s) following the phrase are part of the claimed invention. This rejection may be obviated by replacing "if" with --when--.

With respect to claims 6 and 11, a broad range or limitation together with a narrow range or limitation that falls within the broad range or limitation (in the same claim) is considered indefinite, since the resulting claim does not clearly set forth the metes and bounds of the patent protection desired. See MPEP § 2173.05(c). Note the explanation given by the Board of Patent Appeals and Interferences in *Ex parte Wu*, 10 USPQ2d 2031, 2033 (Bd. Pat. App. & Inter. 1989), as to where broad language is followed by "such as" and then narrow language. The Board stated that this can render a claim indefinite by raising a question or doubt as to whether the feature introduced by such language is (a) merely exemplary of the remainder of the claim,

and therefore not required, or (b) a required feature of the claims. Note also, for example, the decisions of *Ex parte Steigewald*, 131 USPQ 74 (Bd. App. 1961); *Ex parte Hall*, 83 USPQ 38 (Bd. App. 1948); and *Ex parte Hasche*, 86 USPQ 481 (Bd. App. 1949). In the present instance, claim 6 recites the broad recitation weighting, and the claim also recites "especially with a weighting that decreases ..." which is the narrower statement of the range/limitation. Also, claim 11 recites the broad recitation a movement-detecting device, and the claim also recites "especially an electrocardiograph" which is the narrower statement of the range/limitation.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1 and 9-11 are rejected under 35 U.S.C. 102(b) as being anticipated by Flohr et al. (6,381,487).

With respect to claim 1, Flohr et al. discloses a computer tomography method having the following steps:

a) generation by a beam source (1) of a beam bundle (2) passing through a periodically moving object (5),

b) generation of a relative movement (via 8) between the beam source on the one hand and the object on the other hand (Col. 6, lines 40-45), which comprises a rotation about an axis of rotation (z-axis),

c) acquisition by means of a detector unit (3), during the relative movement, of measured values that are dependent on the intensity in the beam bundle on the other side of the object (Col. 6, lines 53-55), an acquisition time being allocated to each measured value and to the beam causing the respective measured value (Col. 7, lines 19-28),

d) detection of a movement signal depending on the movement of the object by means of a movement-detection device (17) and determination of periods of the periodic movement by means of the detected movement signal (Col. 7, lines 19-28),

e) reconstruction (via 11) of a computer tomography image of the object from the measured values (Col. 6, lines 53-62), wherein only measured values whose acquisition times lie within the periods (Figure 1) in time intervals (Figures 2, 4 and 5) are used, which are so determined that a similarity measure applied to intermediate images of a same subregion of the object is minimized (Col. 5, line 66 – Col. 6, line 7), wherein different intermediate images are reconstructed using measured values from time intervals from different periods (Col. 3, line 59 – Col. 4, line 7, Col. 4, lines 31-49 and Figures 3-4).

With respect to claim 9, Flohr et al. further discloses the detected movement signal is an electrocardiogram (17).

With respect to claim 10, Flohr et al. further discloses a period determined in step d) corresponds to the distance of time between two adjacent R-peaks of the electrocardiogram (Figures 3 and 4).

With respect to claim 11, Flohr et al. further discloses an apparatus (Figure 10) having

a beam source (1) for generating a beam bundle (2) passing through (Figure 10) a periodically moving object (5),

a drive arrangement (13) for generating a relative movement between the beam source on the one hand and the object on the other hand, which comprises a rotation about an axis of rotation (z),

a detector unit (3) for acquiring measured values that depend on the intensity in the beam bundle on the other side of the object, during the relative movement, wherein an acquisition instant is allocated to each measured value and to the beam causing the respective measured value (Col. 6, lines 53-55),

a movement-detecting device (17), an electrocardiograph, for detecting periods of the periodic movement by means of a movement signal depending on the movement of the object,

a reconstruction unit (11) for reconstruction of a computer tomography image of the object from the measured values (Col. 6, lines 55-62),

a control unit (computer) for necessarily controlling the beam source, the drive arrangement, the detector unit, the movement-detection device and the reconstruction unit in accordance with the following steps:

a) generation by a beam source of a beam bundle passing through a periodically moving object (Col. 6, line 28 – Col. 7, line 37 and Figure 10),

b) generation of a relative movement between the beam source on the one hand and the object on the other band, which comprises a rotation about an axis of rotation (Col. 6, line 28 – Col. 7, line 37 and Figure 10),

c) acquisition by means of a detector unit, during the relative movement, of measured values that are dependent on the intensity in the beam bundle on the other side of the object, an acquisition time being allocated to each measured value and to the beam causing the respective measured value (Col. 6, line 28 – Col. 7, line 37 and Figure 10),

d) detection of a movement signal depending on the movement of the object by means of a movement-detection device and determination of periods of the periodic movement by means of the detected movement signal (Col. 6, line 28 – Col. 7, line 37 and Figure 10),

e) reconstruction of a computer tomography image of the object from the measured values (Col. 6, line 28 – Col. 7, line 37 and Figure 10), wherein only measured values whose acquisition times lie within the periods (Figure 1) in time intervals (Figures 2, 4 and 5) are used, which are so determined that a similarity measure applied to intermediate images of a same subregion of the object is minimized (Col. 5, line 66 – Col. 6, line 7), wherein different intermediate images are reconstructed using measured values from time intervals from different periods (Col. 3, line 59 – Col. 4, line7, Col. 4, lines 31-49 and Figures 3-4).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 2-5 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Flohr et al. as applied to claim 1 above, and further in view of Rasche et al. (WO02/103639 A2).

With respect to claim 2, Flohr et al. discloses the method as recited above.

Flohr et al. further discloses in step e)

i) determination of a subregion of the object which is traversed both by beams whose acquisition instants lie in the time interval (Col. 5, line 66 – Col. 7, line 5),

ii) generation of a first intermediate image by reconstruction of the subregion using measured values whose acquisition instants lie in the time interval (Col. 5, line 66 – Col. 7, line 5),

iii) generation of a further intermediate image by reconstruction of the subregion using measured values whose acquisition instants lie in the time interval (Col. 5, line 66 – Col. 7, line 5),

iv) determination of a similarity value by applying a similarity measure to the first and the further intermediate image (Col. 5, line 66 – Col. 7, line 5),

v) modifying the interval width and/or the interval position of the time interval (Col. Col. 9, lines 62-67), and

repetition of the steps iii) to v) until a break-off criterion dependent on the similarity value is satisfied (Col. 9, lines 56-61).

Flohr et al. fails to explicitly disclose in step e) initially in each case a time interval having a pre-determinable interval width is arranged at a pre-determinable interval position in each period, in that each period forms a respective period pair with a chronologically immediately preceding period and a chronologically immediately following period, and in that for each period pair the following steps are carried out:

ii) exclusively using measured values whose acquisition instants lie in the time interval of the one period, and

iii) exclusively using measured values whose acquisition instants lie in the time interval of the other period.

Rasche et al. teaches in step e) initially in each case a time interval having a pre-determinable interval width is arranged at a pre-determinable interval position in each period, in that each period forms a respective period pair with a chronologically immediately preceding period and a chronologically immediately following period (Abstract and Figures 1 and 2), and in that for each period pair the following steps are carried out:

ii) exclusively using measured values whose acquisition instants lie in the time interval of the one period (Abstract and Figures 1 and 2), and

iii) exclusively using measured values whose acquisition instants lie in the time interval of the other period (Abstract and Figures 1 and 2).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method of Flohr et al. to include the respective period pair of Rasche et al., since a person would have been motivated to make such a modification to improve temporal resolution of the reconstructed image (Page 1, line 9) as taught by Rasche et al.

With respect to claim 3, Flohr et al. as modified above suggests the method as recited above. Flohr et al. further discloses taking into consideration in succession steps i) to v) (Col. 5, line 66 – Col. 7, line 5 and Col. 9, lines 56-67).

Flohr et al. fails to explicitly teach chronologically consecutive period pairs.

Rasche et al. teaches chronologically consecutive period pairs (Abstract and Figures 1 and 2).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method of Flohr et al. to include the period pairs of Rasche et al., since a person would have been motivated to make such a modification to improve temporal resolution of the reconstructed image (Page 1, line 9) as taught by Rasche et al.

With respect to claim 4, Flohr et al. further discloses the break-off criterion in step v) leads to a termination when the similarity value falls below a predetermined similarity threshold (Col. 5, line 66 - Col. 6, line 7 and Col. 9, lines 56-61).

With respect to claim 5, Flohr et al. discloses the method as recited above.

Flohr et al. further discloses the application of the similarity measure to two intermediate images of the same subregion comprises the following steps:

subtraction (Col. 5, lines 28-30) of an image value of a region from the one intermediate image from an image value of the same region from the other intermediate image for each subdivision region (Col. 5, line 66- Col. 6, line 5) to form a respective absolute difference,

summation of the absolute differences, wherein the resulting sum is the similarity value of the similarity measure (Equation 3).

Flohr et al. fails to disclose division of the subregion into several subdivision regions.

Rasche et al. teaches division of the subregion into several subdivision regions (Page 6, lines 6-7).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method of Flohr et al. to include the subdivision of Rasche et al., since a person would have been motivated to make such a modification to increase available information by accounting for different individual parts of the heart that move to different extents at different instants (Page 1, line 9) as taught by Rasche et al.

With respect to claim 8, Flohr et al. discloses the method as recited above.

Flohr et al. fails to disclose the intermediate images are reconstructed with a lower spatial resolution than the CT image.

Rasche et al. teaches the intermediate images are reconstructed with a lower spatial resolution than the CT image (Abstract).

It would have been obvious to one of ordinary skill in the art at the time the invention

was made to modify the method of Flohr et al. to include the lower spatial resolution of Rasche et al., since a person would have been motivated to make such a modification to reduce computation time (page 3, line 30 – Page 4, line 4) as taught by Rasche et al.

7. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Flohr et al. as applied to claim 1 above, and further in view of Taguchi et al. ("High temporal resolution for multislice helical computed tomography", 2000, Medical Physics, Volume 27, Number 5, Pages 861-872).

With respect to claim 6, Flohr et al. discloses the method as recited above.

Flohr et al. fails to disclose the measured values whose acquisition instants lie in a time interval are weighted before the reconstruction of the intermediate images and the CT image, with a weighting that decreases in size the further away from the middle of a time intervals the acquisition instant of a measured value lies.

Taguchi et al. teaches disclose the measured values whose acquisition instants lie in a time interval are weighted before the reconstruction of the intermediate images and the CT image, with a weighting that decreases in size the further away from the middle of a time intervals the acquisition instant of a measured value lies (Abstract, line 7 and Figure 2).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method of Flohr et al. to include the weighting of Taguchi et al., since a person would have been motivated to make such a modification to improve image quality for many applications which requires high temporal resolution such as cardiac imaging (Page 871,

Col. 1, lines 26-29) as taught by Taguchi et al.

8. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Flohr et al. as applied to claim 1 above, and further in view of Bruder et al. (20030072419).

With respect to claim 7, Flohr et al. discloses the method as recited above.

Flohr et al. fails to disclose the reconstruction of the intermediate images and/or the CT image is effected with a filtered back-projection.

Bruder et al. teaches the reconstruction of the intermediate images and/or the CT image is effected with a filtered back-projection (Paragraph 28).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method of Flohr et al. to include the filtered back-projection of Bruder et al., since a person would have been motivated to make such a modification to simplify the reconstruction process by utilizing a mature, well understood standard reconstruction method (Paragraph 28) as implied by Bruder et al.

9. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Flohr et al. as applied to claim 1 above, and further in view of Hsieh (6,529,575).

With respect to claim 12, Flohr et al. discloses the method as recited above.

Flohr et al. fails to explicitly disclose a computer program for a control unit for controlling a beam source, a drive device, a detector unit, a movement-detection device and a reconstruction unit of a computer tomograph for implementing a method.

Hsich teaches teach a computer program for a control unit for controlling a beam source, a drive device, a detector unit, a movement-detection device and a reconstruction unit of a computer tomograph for implementing a method (Col. 8, line 57 - Col. 9, line 12).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the configuration of Flohr et al. to include the computer program of Hsieh, since a person would have been motivated to make such a modification to improve usability of the configuration by more easily update existing systems to implement the invention (Col. 8, line 66 - Col. 9, line 1) as taught by Hsieh.

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Grass et al. ("A Projection-Based Method for Motion-Compensated Noise Suppression", 1998, Philips J. Res., Pages 283-298) discloses a method of motion estimation and motion compensation utilizing similarity measures to estimate motion and gauge image quality (Abstract and Section 2. Method, Pages 284-289).

Grass et al. (US 20010043671 A1) discloses reducing patient motion artifacts by combining 3D data sets utilizing transformation rules, the transformation rules are based in part of motion determined with similarity measures (Abstract, Paragraphs 7-8, 19 and 28).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOHN M. CORBETT whose telephone number is (571)272-8284. The examiner can normally be reached on M-F 8 AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward J. Glick can be reached on (571) 272-2490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J. M. C./
Examiner, Art Unit 2882

/C. G. K./

/Edward J Glick/
Supervisory Patent Examiner, Art Unit 2882